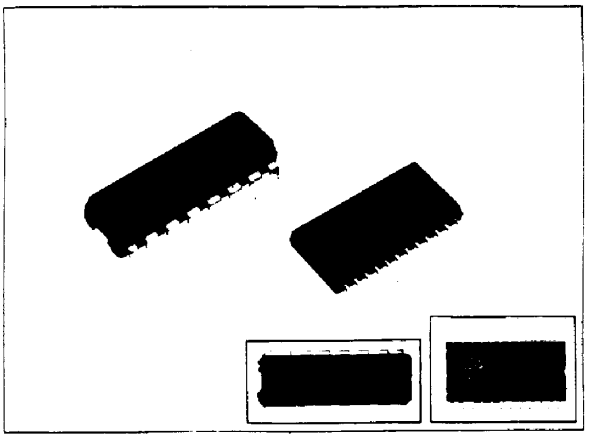
4-bit I/O CONNECTION REAL TIME CLOCK MODULE

RTC-58321/58323

- Built-in quartz oscillator allows adjustment-free and efficient operation
- Incorporating time counter (hour, minute, sec.) and calender counter (year, month, day of week)
- Either 12H or 24H selectable and leap year automatically adjustable
- Standard signal output selectable among a choice of 1024 Hz, 1 sec ,60 sec., and 1 hour
- Provided with counter start, stop and reset functions
- Data transmission is by 4-bit bidirectional bus line and memory read and write method
- Low current consumption and backup function provided



Actual size

■Specifications (characteristics)

■Absolute Maximum Rating

Item	Symbol	Condition	Specifications	Unit
Power source voltage	V_{DD}	Ta=25°C	−0.3 to 7.0	V
Input and output voltage	$V_{I/O}$	Ta=25°C	GND −0.3 to V_{DD}+0.3	
Storage temperature	T_{STG}	——	−55 to +85	°C
Soldering condition	T_{SOL}	RTC-58321	Under 260°C within 10 sec. (lead part) (package should be less than 150°C)	
		RTC-58323	Under 260°C within 10 sec. × up to 2 times or under 230°C within 3 min.	

■Operating Range

Item	Symbol	Condition	Specifications	Unit
Operating voltage	V_{DD}	——	4.5 to 5.5	V
Operating temperature	T_{OPR}	RTC-58321	−10 to +70	°C
		RTC-58323	−30 to +85	
Data holding voltage	V_{DH}	——	2.2 to 5.5	V
CSI data holding time	t_{CDR}	Refer to the data holding timing	0 MIN.	μs
Operation restoring time	t_R			

■Frequency characteristics and current consumption characteristics

Item	Symbol	Condition		Specifications	Unit
Frequency tolerance	Δf/fo	Ta=25°C V_{DD}=5V	58321A	±10	ppm
			58321B	±50	
			58323	5±20	
Frequency temperature characteristics	——	0 to +70°C (25°C reference temperature)		+10/−120	
Aging	fa	V_{DD}=5V, Ta=25°C, first year		±5 MAX.	ppm/Y
Shock resistance	S. R.	Drop test of 3 times on a hard board from 75cm height or 3000G×0.3ms×1/2 sine wave×3 directions		±10 MAX.	ppm
Current consumption	$I_{DD}1$	V_{DD}=5V, CS_1=0V		40 MAX.	μA
	$I_{DD}2$	V_{DD}=3V, CS_1=0V		20 MAX.	

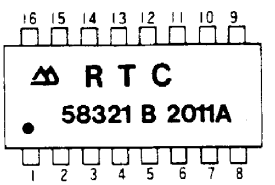
■Electrical Characteristics

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Applicable terminal
"H" input voltage	V_{IH1}	——	3.6	–	–	V	Input other than CS_1
"H" input voltage	V_{IH2}	——	V_{DD}−0.5	–	–		CS_1
"L" input voltage	V_{IL}	——	–		0.8		——
"L" output voltage	V_{OL}	I_{OL}=1.6mA	–	–	0.4		——
"L" output current	I_{OL}	V_O=0.4V	1.6	–	–	mA	——
"H" input current	I_{IH}	V_I=5V	10	30	80	μA	Input other than D_0 to D_3
"L" input current	I_{IL}	V_I=0V	–	–	−1		
Input leak current	I_{LIH}	V_I=5V	–	–	1		D_0 to D_3
Input OFF leak current	I_{LIL}	V_I=0V	–	–	−1		——
Input capacity	C_I	Input frequency 1MHz	–	5	–	pF	——
Oscillation startup time	t_{OSC}	V_{DD}=5V Ta=25°C	–	1.5	3.0	sec	Busy output

* Unless otherwise stated, characteristics (specifications) shown in the above table are based on the rated operating temperature and voltage condition.

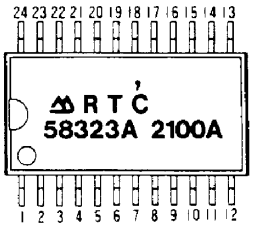
■Terminal Connection

●RTC-58321



1. CS_2 16. V_{DD}
2. WRITE 15. NC
3. READ 14. NC
4. D_0 13. CS_1
5. D_1 12. TEST
6. D_2 11. STOP
7. D_3 10. $\overline{BUSY}$
8. V_{SS} 9. ADDRESS WRITE

●RTC-58323



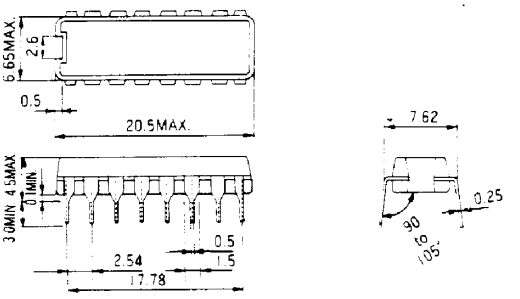
1 to 4. NC
5. CS_2
6. WRITE
7. READ
8. D_0
9. D_1
10. D_2
11. D_3
12 to 24. —
17. CS_1
16. TEST
15. STOP
14. $\overline{BUSY}$
13. ADDRESS WRITE
2. GND

●NC is not connected internally

■External Dimensions

(Unit: mm)

●RTC-58321



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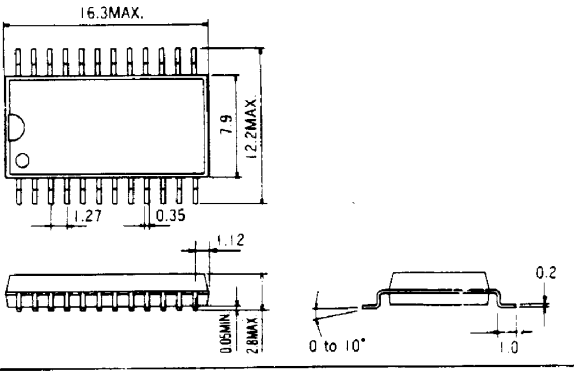


■Supplement

0 = "L" level 1 = "H" level

Item	Description
* mark	Writable. Recognized as 0 while in read mode.
24/12	"1" = 24 H mode, "0" = 12H mode
PM/AM	"1" = PM, "0" = AM. In 24 H mode, this will be "0"
D_3 and D_2 of 10 days digit	Used to select leap year. Calculated according to the surplus after dividing 10 year digit by 4.

Calendar	D_3	D_2	Surplus after dividing 10 years digit by 4	Example of leap year
Gregorian calendar	0	0	0	92, 96, 00
Spare	0	1	3	
Spare	1	0	2	
Spare	1	1	1	

Reset register	These selections are for resetting 5-stage and the Busy circuit after $1/2^{15}$ frequency stage. Resetting is activated by latching this code on to the address latch and setting WRITE = H.
Standard signal register	By latching this code to the address latch and setting READ to H, the standard signals will be output at D_0 to D_3.

Note: · Do not enter erroneous data for clock.
This may result in time keeping error.
· Do not change STOP more than once while in BUSY mode.

■Switching Characteristics

● Write & read mode

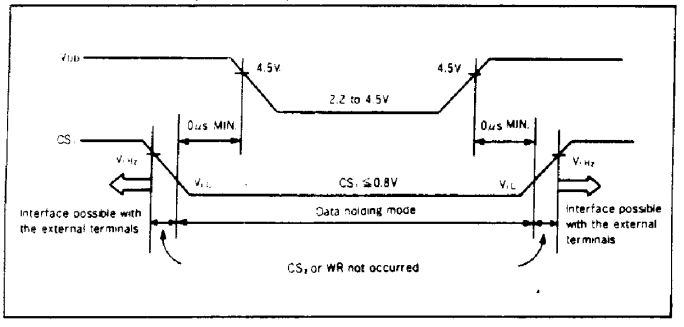
(V_{DD} = 5V ± 0.5V)

Item	Symbol	Condition	MIN	TYP	MAX	Unit
CS setup time	t_{CS}	–	0	–	–	μS
Address setup time	t_{AS}	–	0	–	–	μS
Address write pulse width	t_{AW}	–	0.5	–	–	μS
Address hold time	t_{AH}	–	0.1	–	–	μS
Data setup time	t_{DS}	–	0	–	–	μS
Write pulse width	t_{WW}	–	2	–	–	μS
Data hold time	t_{DH}	–	0	–	–	μS
Read inhibit time	t_{RI}	–	0	–	–	μS
Read access time	t_{RA}	–	–	–	*	μS
Read delay time	t_{DD}	–	–	–	1	μS
CS hold time	t_{CH}	–	0	–	–	μS

* $t_{RA} = 1\mu S + C \times R \times \ln [V_{DD}/(V_{DD}-V_H)]$

C : Data line capacity
R : Pull-up resistance
V_H: "H" input voltage connected to the data line
ln : Natural logarithm

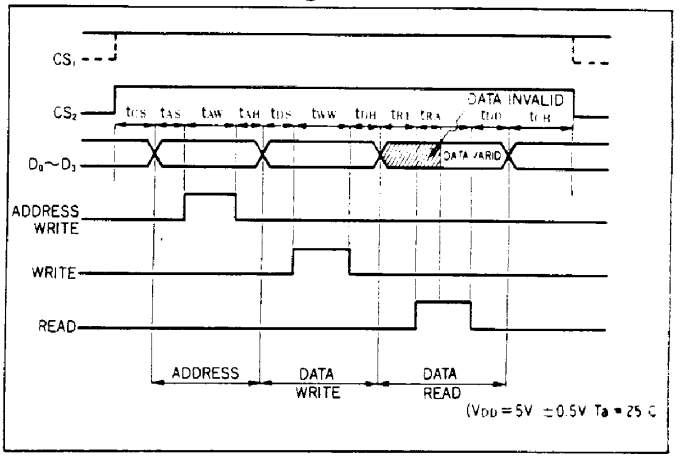
● Data Holding Timing



■Register Table

Address	D_3 A_3	D_2 A_2	D_1 A_1	D_0 A_0	Name of register	D_3	D_2	D_1	D_0	Count	Note
0	0	0	0	0	S_1	s_8	s_4	s_2	s_1	0 to 9	1 sec. digit register
1	0	0	0	1	S_{10}	*	s_{40}	s_{20}	s_{10}	0 to 5	10 sec. digit register
2	0	0	1	0	MI_1	mi_8	mi_4	mi_2	mi_1	0 to 9	1 min. digit register
3	0	0	1	1	MI_{10}	*	mi_{40}	mi_{20}	mi_{10}	0 to 5	10 min. digit register
4	0	1	0	0	H_1	h_8	h_4	h_2	h_1	0 to 9	1 hour digit register
5	0	1	0	1	H_{10}	24/12	PM/AM	h_{20}	H_{10}	0 to 2 or 0 to 1	10 hours digit register
6	0	1	1	0	W	*	w_4	w_2	w_1	0 to 6	Week register
7	0	1	1	1	D_1	d_8	d_4	d_2	d_1	0 to 9	1 day digit register
8	1	0	0	0	D_{10}	Leap year selection		d_{20}	d_{10}	0 to 3	10 days digit register
9	1	0	0	1	MO_1	mo_8	mo_4	mo_2	mo_1	0 to 9	1 month digit register
A	1	0	1	0	MO_{10}	*	*	*	mo_{10}	0 to 1	10 months digit register
B	1	0	1	1	Y_1	y_8	y_4	y_2	y_1	0 to 9	1 year digit register
C	1	1	0	0	Y_{10}	y_{80}	y_{40}	y_{20}	y_{10}	0 to 9	10 years digit register
D	1	1	0	1		*	*	*	*		Reset register
E	1	1	1	0		1 hour	1 min.	1 sec.	1024Hz		Standard signal register
F	1	1	1	1							

● Write and read timing



■Block Diagram